



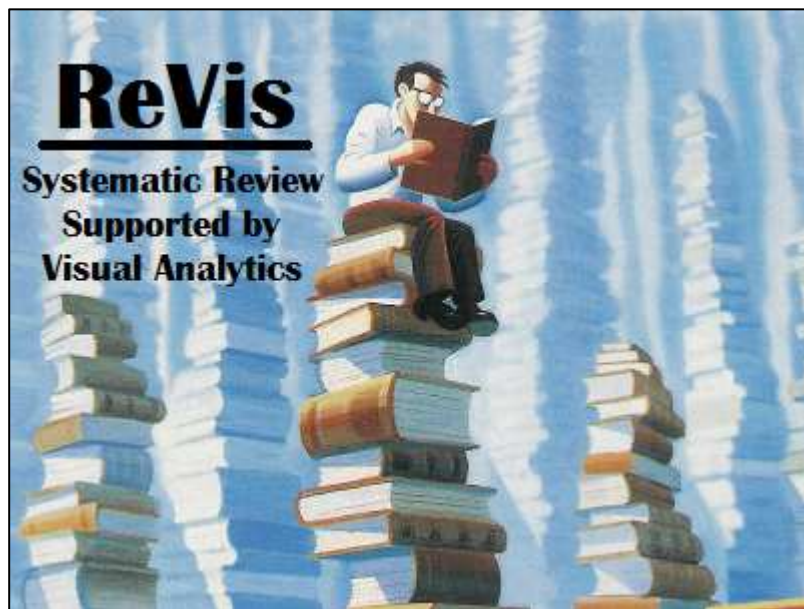
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ReVis: User Manual

v0.3

Systematic Review
Supported by Visual Analytics



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User Manual

Introduction and Overview

Projection Explorer (PEX)¹ is a flexible visualization tool that has several text handling facilities, which allows for a VTM (Visual Text Mining) exploration of a collection of documents. It is an open source tool that has been developed at the University of Sao Paulo.

ReVis (Systematic Review Supported by Visual Analytics) is an extension of PEX created to support selection and quality evaluation of primary studies in systematic reviews. It offers visual mappings of the set of primary studies to be reviewed, in order to help the user explore the data.

In ReVis the selection and quality evaluation are performed in four consecutive stages: (1) the pre-selection, when the user includes or excludes studies based on their abstracts; (2) the selection, when the user includes or excludes studies based on their full texts; (3) quality evaluation, when the user applies a score to the selected papers based on the quality of their content; and (4) review, when an expert has the chance to change the selection or quality evaluation if needed.

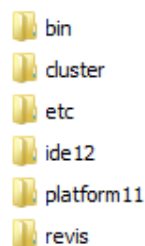
It's important to note that ReVis acts only on the selection and quality evaluation of the studies, not on the initial search. To use the tool, the user must first create the queries and obtain the full set of primary studies to be analyzed.

Installation


First you must download the program ReVis in:

- <http://ccsl.icmc.usp.br/redmine/projects/revis/files>

After, you must decompress the file. The content will be:



¹ <http://infoserver.lcad.icmc.usp.br/infovis2/PEX>

Next, open the folder “bin” and run the file:  `revis.exe`

Getting Started

In order to use ReVis to support the primary studies' selection in your systematic review, it is first necessary to prepare an input file, according to a few rules. This input file will include all the primary studies that returned from your search; thus, the search is not made from within the tool. After you prepared your input file, you can create a new project within ReVis to generate the visualizations and perform the selection.

Detailed descriptions of the input file and the tool's user interface are provided in the next sections.

Creating the Input File

The BibTeX² file format (*.bib*) is currently the only format accepted by ReVis. It is used to describe and process lists of references, mostly in conjunction with LaTeX³ documents. For details about the general structure of a BibTeX file, please refer to the site. We recommend using the JabRef⁴ tool for the input file creation; it is free and open source and it is available online for download.

ReVis treats a BibTeX input file as a collection of entries where each entry represents one primary study returned by your search. From all possible fields available for BibTeX entries, the following are the most important when using ReVis.

In this entry, the first line (a) contains the entry key. There is no special formatting for this field, but if you're using JabRef, we recommend using the tool's automatic key generation feature. The (b) item includes the names of the authors of the entry. They can be written as the last name followed by the initials, separated by comma. Each author is separated from the others with an “and” statement. Items (c) and (d) are, respectively, the title and the year of the entry. The abstract (d) is not often included in BibTeX files, but in this case it is absolutely necessary; without it, the visualizations can't be generated. The remaining lines (e) are the references of the

² <http://www.bibtex.org/>

³ <http://www.latex-project.org/>

⁴ <http://jabref.sourceforge.net/>

entry – each reference represented by its title, one per line. It is very important that titles are written in the exact same way throughout the whole file or else the tool will not be able to correlate entries.

```

@ARTICLE{Martins2010,                                (a)
    author = {Martins, R. and Felizardo, K.},         (b)
    title = {ReVis: User Manual},                    (c)
    year = {2010},                                    (d)
    abstract = {ReVis is a tool for ...},              (e)
    references = {title1                               (f)
                  title2
                  ...
    }
}

```

Figure 1 – Example of a ReVis entry on a BibTeX file

Creating a Project

With the input file ready, start ReVis and you will see the tool's main menu (Figure 2).



Figure 2 – ReVis main menu

To start a new project, select “File” then “New Project...” (Figure 3).

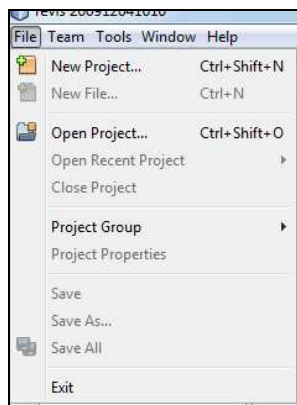


Figure 3 – ReVis “File” menu

You will see the window on Figure 4; choose “ReVis Project” and press “Next”.

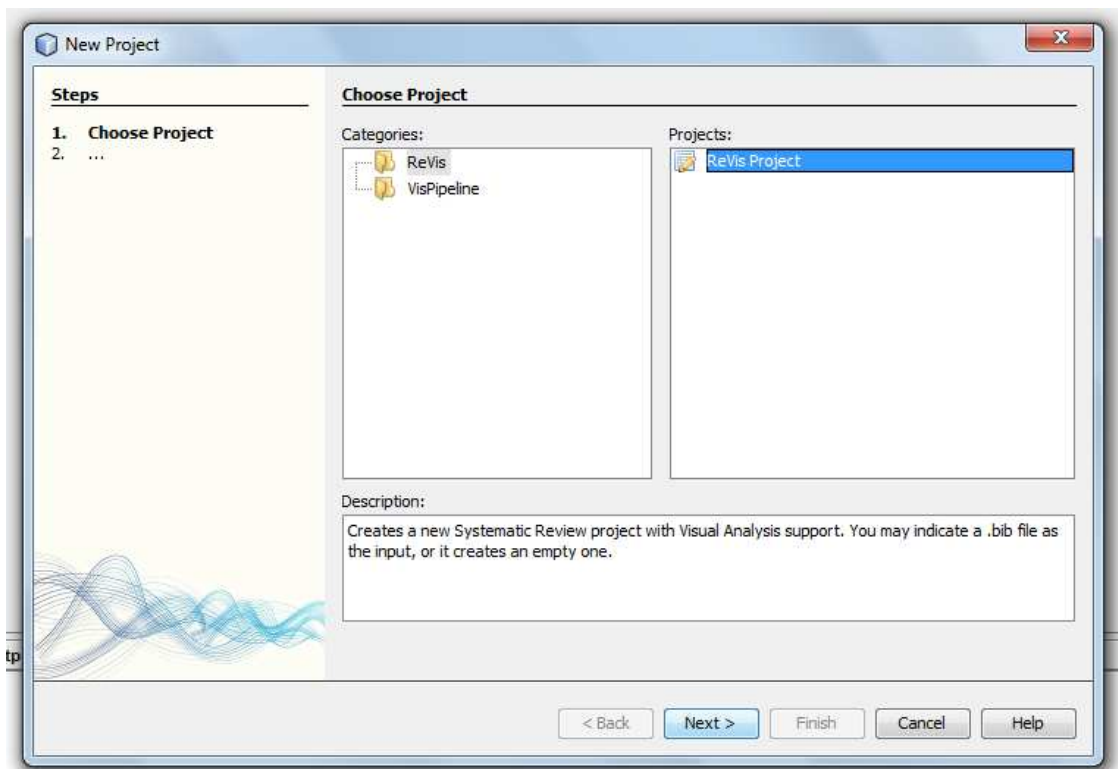


Figure 4 – “New Project”, initial window

Fill in your project's name, the location where it will be stored and indicate where is your BibTeX input file (Figure 5).

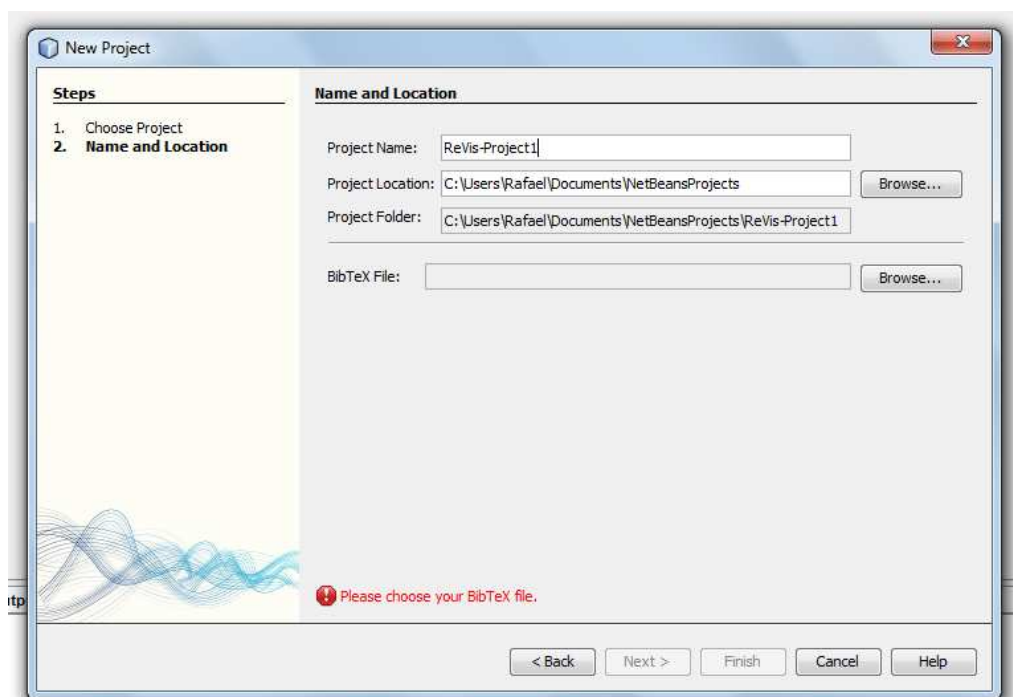


Figure 5 – “New Project”, second window

Press “Finish” and the project will be created. You can see it in the “Projects” view, usually in the left side of the main window. There’s a specific folder and file structure for ReVis projects (Figure 6); you must understand this structure and the utility of each file in order to customize them for your own review. The detailed description of each file is presented in the next section.

The ReVis Project's Structure

The folder/file structure of a ReVis project is shown in Figure 6. Each file has an important role on the generation of the visualizations and the performing of the primary study selection. Properties files can be edited inside the tool by double-clicking them; BibTeX files can also be edited, but in text-mode only (as stated earlier, we recommend a tool such as JabRef).

Each folder and file is explained below in details. After you understand the structure, edit the “**selection**” and “**quality**” files according to your review, then check the next section on how to start the selection.

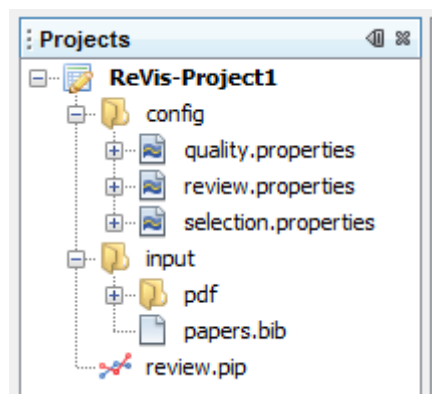


Figure 6 – A ReVis project's structure

- “**config**” folder – This folder stores configuration files for the review as “properties” files. The general format for the entries is *name = value* (specific details are explained below).
- “**selection.properties**” – Inclusion and exclusion criteria for the first and second steps of the selection. An example (the default) is show in Figure 7; although it follows the same rule as all “properties” files (*name = value*), the *name* part must begin with “i.” for inclusion criteria or “e.” for exclusion criteria. Also, the *value* part is actually the description of the criterion.

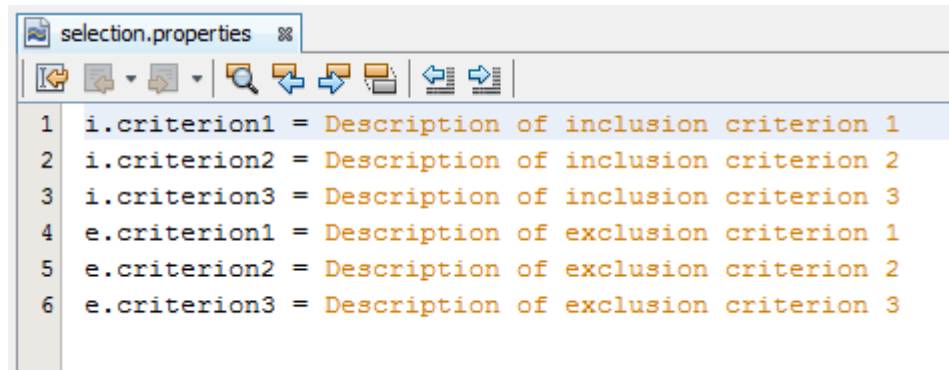


Figure 7 – “selection.properties” file

- **“quality.properties”** – Quality criteria for the third step of the selection (*quality evaluation*). The entries are in the format *name = score*, for each possible quality score. An example (the default) is show in Figure 8.

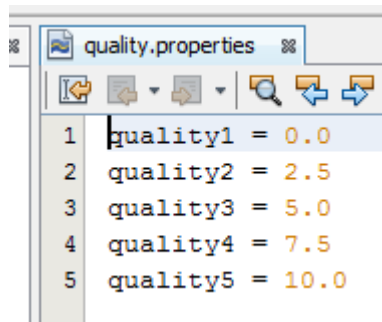


Figure 8 – “quality.properties”

- **“review.properties”** – This file is used internally by the tool; unless something’s wrong with the review, the user won’t have to edit it.
- **“input” folder** – Stores the BibTeX input file for each of the review’s steps and, optionally, the full text PDF’s of the entries (in the “pdf” subfolder, detailed below).
- **“pdf” folder** – To open the full texts of the primary studies during the second step of the review, you must put the PDF files in this folder. The names of the files must match the BibTeX key of the respective entry.
- **“papers.stageN.bib”** – These are the input files for each stage (*N*) of the selection. They are used internally and shouldn’t be edited by the user.
- **“review.pip”** – The pipeline file for the review, used to generate the visualizations. It is used internally and shouldn’t be edited by the user.

Starting the Selection

To start the selection, press the green “play” button on the tool’s main toolbar (Figure 9) while focusing your project. Note: make sure you edited the “**selection**” and “**quality**” files as stated in the previous section.



Figure 9 – Main toolbar

Visualizations

After a few messages of progress, both in dialogs and in the “output” view, four visualizations are created and displayed. Of these, three are immediately visible; the “Network Viewer” is initially behind “Projection”.

Edge Bundles

The first visualization on the left is called “Edge Bundles” (Figure 10). Each of the small circles (*instances*) represents one primary study and the edges link studies that have cited each other. The edge direction is represented by the color: the citing study is on the light blue end and the cited study is on the dark blue end of the edge. The name of the visualization comes from the fact that the edges that link primary studies are “bundled”, or grouped together by proximity [1].

Instances are hierarchically distributed along the three concentric circles of the radial layout of the visualization. The hierarchy is based on the frequency of text topics that are automatically extracted from the studies’ abstracts by the tool. You can check the topics by hovering the mouse over the arcs on the outer circles. You can also see the instances’ keys (as defined on the BibTeX input) by hovering the mouse over them.

Initially, all instances are grey, which means they haven’t been analyzed yet. According to the color scale on the top left of the view, the colors vary from red – the study has been excluded – to green – the study has been included (inclusion/exclusion is done on the *Table* view). In the second step the scale changes; studies included/excluded in the first step are colored in “weak” red and green, while studies included/excluded in the second step itself are colored in “strong” red and green.

Double-clicking an instance will activate a context-dependent action: on the first step, it opens the study's abstract; on the second step, it opens the full text (if available). Single-clicking an instance will select it, and also highlight it on all other visualizations. You can also select a group of instances by dragging the left or right mouse button or by single-clicking a topic arc.

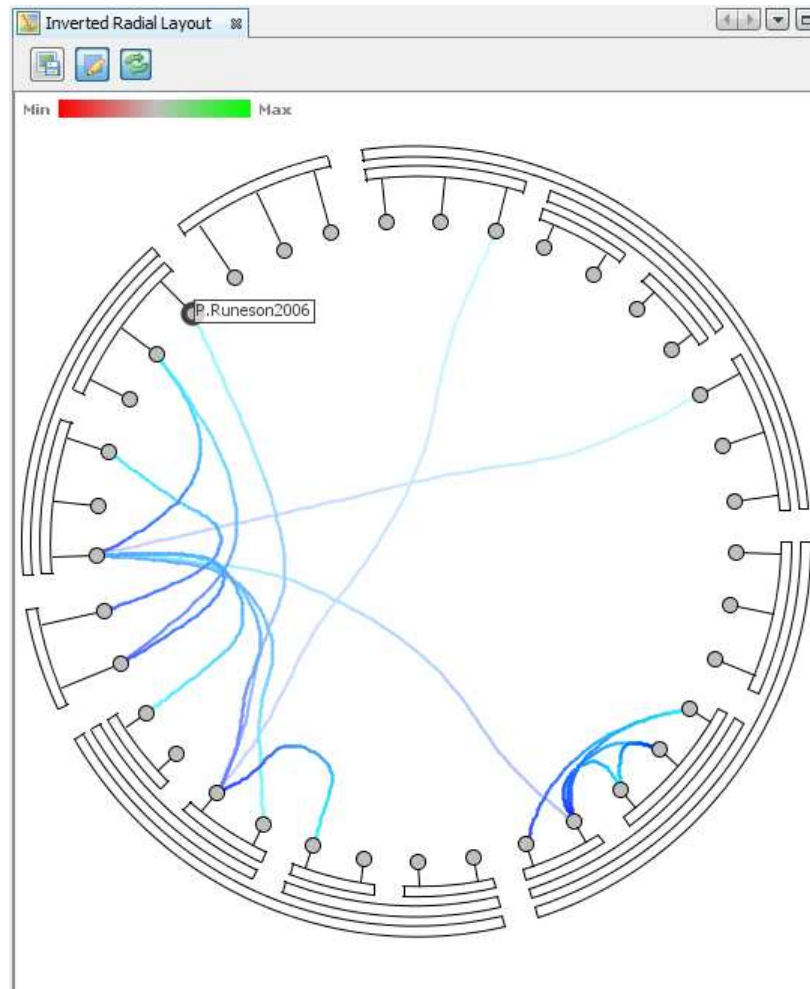


Figure 10 – Edge Bundles

There are three action buttons available on the toolbar of the “Edge Bundles” view (to see the names, hover the mouse over them):

- **Scalar:** this is located on the main toolbar (above the mappings) and works for all views. When there are different attributes to be viewed as colors, this changes which one is active. The two most common are “Sys. Review”, which shows the included/excluded status, and “Quality”, which shows the instances’ scores.
- **Save Image:** saves a PNG image of the current state of the visualization in a user-selected folder.

- **Instance Selection:** default selection mode for instances; currently cannot be changed.
- **Identity Coordination:** default coordination mode; currently cannot be changed.

Projection

The visualization on the right (before the table) is called a “Projection”. It is a 2D document map that distributes instances along the screen by bringing closer the most similar ones and separating the most different ones, based on the textual content (in this case, the abstract of the studies). Again, as in the *Edge Bundles* view, the small circles represent studies.

Direct user interaction on the *Projection* view is similar to *Edge Bundles*: you can select a single instance or a group by single-clicking or dragging the mouse buttons (which will highlight them in all other views), and double-clicking will show the abstract or the full text. The color scale is also the same, showing instances which were not analyzed, excluded or included (second stage also changes, like in the “Edge Bundles” view).

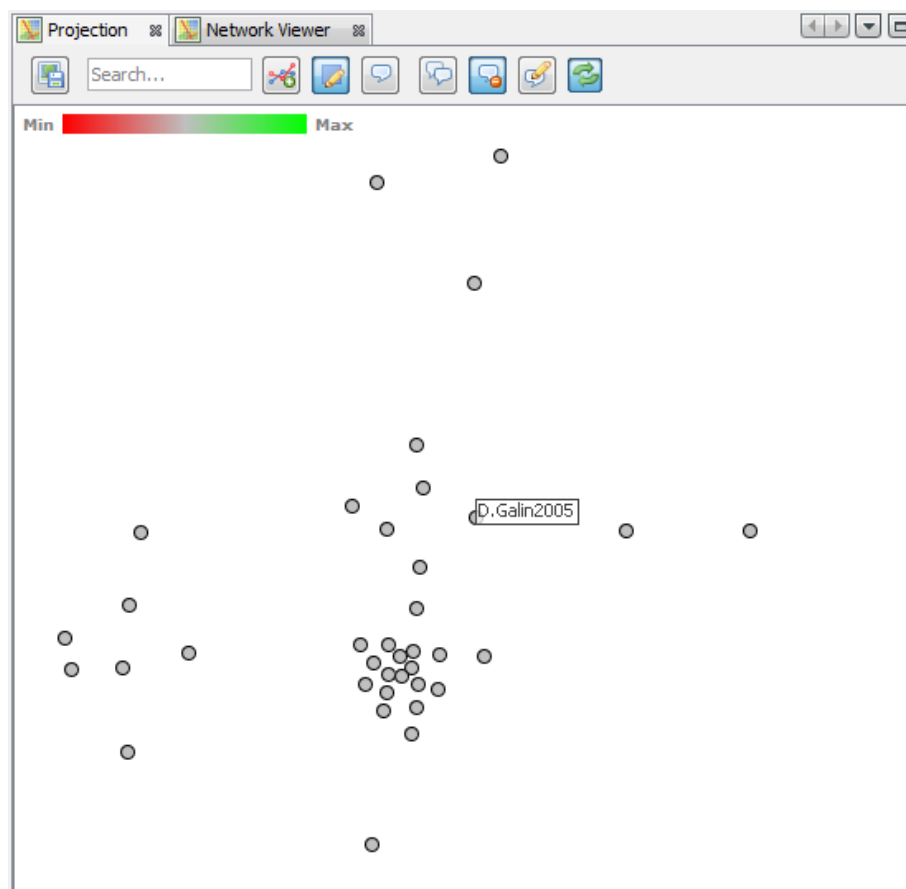


Figure 11 – Projection

The action buttons, however, are quite different than the other views. There are a few more options to be explored in this view, as explained below:

- **Scalar:** this is located on the main toolbar (above the mappings) and works for all views. When there are different attributes to be viewed as colors, this changes which one is active. The two most common are “Sys. Review”, which shows the included/excluded status, and “Quality”, which shows the instances’ scores.
- **Save Image:** saves a PNG image of the current state of the visualization in a user-selected folder.
- **Search....:** textual search on the studies’ abstracts. A new color scale will be created and instances will be colored according to the frequency of the query in their abstracts.
- **Enable/Disable Edges:** initially there are no edges on the projection; you can, however, enable them with this button. The undirected edges will then link nearest neighbors in the projection. When edges are enabled, selecting an instance will also highlight the connected instances.
- **Instance Selection:** default selection mode for instances; with this enabled, selecting will only highlight them in all views.
- **Topic Selection:** alternate selection mode for instances; with this enabled, selecting will also generate and display the most important topics for the selected group.
- **Create Topic Clusters:** this action will ask for a number N of clusters (with a reasonable default) and divide the document set into N groups of nearest neighbors. It will also generate and display the most important topics for each cluster (automatically enabling *Topic Selection*).
- **Show/Hide Labels:** when *Topic Selection* is enabled, this will show or hide the labels that display the generated topics.
- **Highlight Label Clusters:** when *Topic Selection* and this button are enabled, topic clusters will be highlighted when you hover the mouse over them.
- **Identity Coordination:** default coordination mode; currently cannot be changed.

Network Viewer

In the same slot as the *Projection* visualization, but behind it (check the tabs), is the *Network Viewer*. This visualization is created from the references information on the BibTeX input file and shows all the primary studies with their respective referenced papers. It uses a force-based layout, meaning that studies attract each other depending on how strong is their connection (references to each other). Thus, studies that are far from the center are less cited and studies grouped near the center are more cited (Figure 12).

Again, the direct user interaction and the colors are similar to the views already described (please check the two previous sections). A simple selecting in this view, however, will also highlight referenced items that are not on the review themselves (on a lighter gray). Selecting a study that is not on the review (one that is only referenced) will also highlight its “main” study – the study that is on the review and references the first. Since this view has edges automatically enabled, selecting an instance will also select all the connected instances.

The action buttons available in this view are the following:

- **Scalar:** this is located on the main toolbar (above the mappings) and works for all views. When there are different attributes to be viewed as colors, this changes which one is active. The two most common are “Sys. Review”, which shows the included/excluded status, and “Quality”, which shows the instances’ scores.
- **Save Image:** saves a PNG image of the current state of the visualization in a user-selected folder.
- **Enable/Disable Edges:** initially the edges are automatically enabled; you can, however, disable them with this button. This affects the *Force* button and the propagation of instance selection.
- **Start/Stop Force:** as said earlier, the Network Viewer distribution of instances on the 2D area of the screen is made with a force-based layout. You can control this process by starting/stopping the force, if you find it necessary.
- **Instance Selection:** default selection mode for instances; currently cannot be changed.

- **Identity Coordination:** default coordination mode; currently cannot be changed.

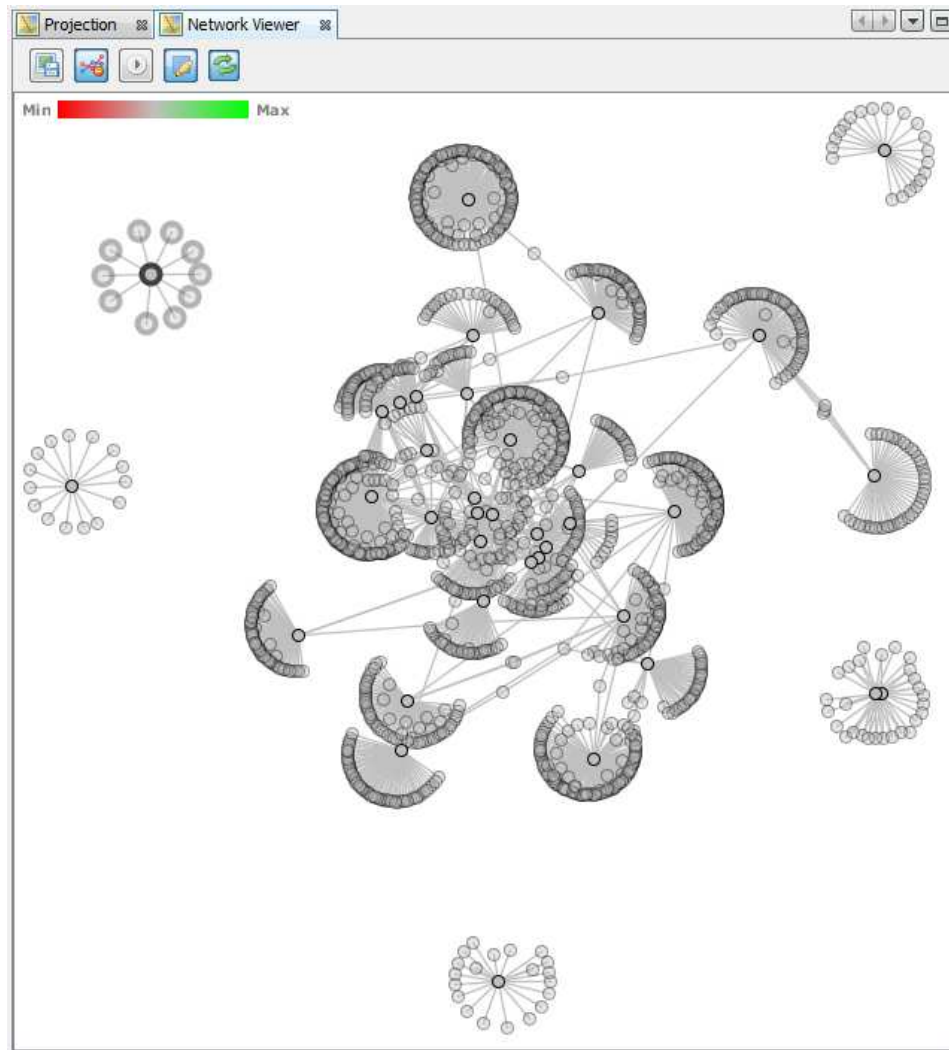


Figure 12 – Network Viewer

Table View

To support the insights obtained with the previously presented visualizations, the *Table View* shows all the studies in a familiar table-like layout and provides the user with the selection/evaluation functions needed for the review.

The color scale used follows the same as the *Edge Bundles* view, so that when you eventually change the color scale in one, the other is automatically updated. One possible user interaction with the table is sorting; by clicking on the headers, you can sort the table by the studies' IDs or by number of citations received.

The most important actions, however, are presented in the right-click popup menu described below (and displayed in Figure 13).

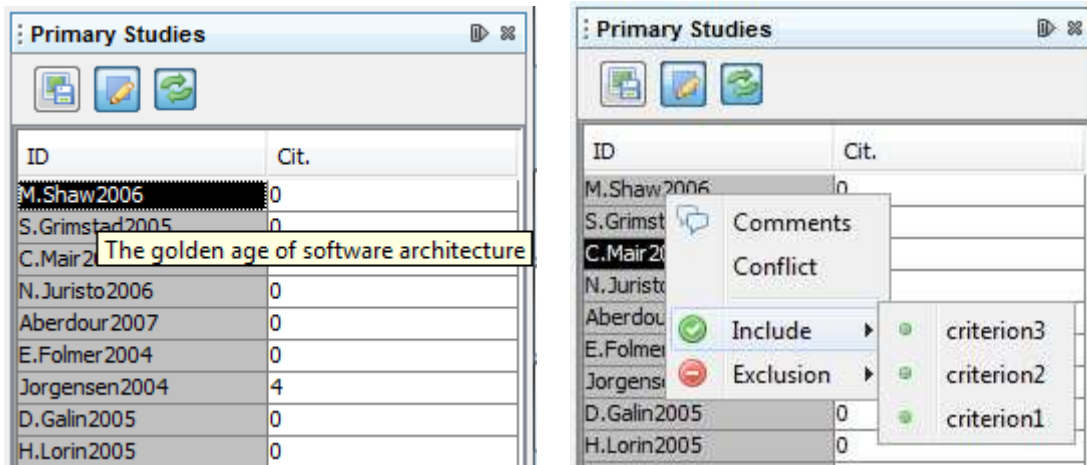


Figure 13 – The Table view

- **Comments:** it's possible to leave review comments on each study by using this feature. The tool will show a dialog with a text area filled with the (possible) current commentaries, allowing for inserting and editing. This is especially useful if the review is being done by more than one reviewer.
- **Conflict:** in case there has been a conflict with one or more studies - whether to include/exclude them or not – this feature can be used to mark the study, so that it can be decided later.
- **Include:** this submenu shows all the inclusion criteria specified in the “selection.properties” file; to include the study in the review, just click on the criteria used to decide. This will change the study color to green.
- **Exclude:** this submenu shows all the exclusion criteria specified in the “selection.properties” file; to exclude the study from the review, just click on the criteria used to decide. This will change the study color to red.
- **Quality:** this submenu is available in stages 3 and 4; it shows the scores specified in “quality.properties” file. By selecting a score, you evaluate the selected study.

Performing the Selection – Four Stages

As stated earlier in the introduction, in ReVis the selection and quality evaluation actions are organized in four main stages. After finishing one stage, you can start the next one by clicking on

the “Finish Current Stage” button on the main toolbar (Figure 14). You can also use the red “Stop Review” button anytime to save the review’s current state and stop it.



Figure 14 – “Finish Current Stage” and “Stop Review” buttons

Remember that no matter which stage you’re in, all visual exploration features are available; use them as you need.

Stage 1: Pre-selection

When you first start your review, this is the stage you’re in. The task is to pre-select your studies by applying the inclusion/exclusion criteria after reading each of the abstracts.

Main actions:

- Double-click studies to read abstract (on *Edge Bundles* or *Table View*);
- Right-click the studies on *Table View* to display the selection menu;
- Include or exclude studies by setting the inclusion or exclusion criteria used;
- If you have any commentary about a study, worth keeping for future stages (or other reviewers), use the “commentary” feature;
- If you are not sure whether to include or exclude a study, set it to “conflict” state.

Use the “Finish Current Stage” button when you’re finished pre-selecting your studies.

Stage 2: Selection

This stage is similar to the first, only now the task is to select your studies by applying the inclusion/exclusion criteria after reading the full text of each pre-selected study. Studies that were excluded on the first stage will appear in light red and included ones in light green. Remember that, in order to be able to read the full text inside ReVis, you must have prepared the “pdf” folder as described earlier.

Main actions:

- Double-click studies to read full text PDFs (on *Edge Bundles* or *Table View*);
- Right-click the studies on *Table View* to display the selection menu;
- Include or exclude studies by setting the inclusion or exclusion criteria used;
- If you have any commentary about a study, worth keeping for future stages (or other reviewers), use the “commentary” feature;
- If you are not sure whether to include or exclude a study, set it to “conflict” state.

Use the “Finish Current Stage” button when you’re finished selecting your studies. Make sure that, by the end of this stage, all studies were either included or excluded, even the ones in “conflict” state. These will be reviewed in the 4th stage.

Stage 3: Quality Evaluation

Using the quality criteria you set on the “quality.properties”, evaluate each of the selected studies based on the full text you read on the previous stage. This is an important part of the systematic review, as it puts all different studies (from different sources) in one same evaluation platform, allowing comparison between them.

Main actions:

- Double-click studies to read full text PDFs (on *Edge Bundles* or *Table View*);
- Right-click the studies on *Table View* to display the quality menu;
- Choose the score for each of the studies by clicking on the appropriate menu item;
- If you have any commentary about a study, worth keeping for the next stage, use the “commentary” feature.

Use the “Finish Current Stage” button when you’re finished evaluating your studies. Make sure that, by the end of this stage, all selected studies were evaluated.

Stage 4: Review by Expert

This stage offers both selection and evaluation features to the reviewer; it's meant to be used by an expert to evaluate – and possibly change – all the decisions that were made during the review.

Main actions:

- Double-click studies to read full text PDFs (on *Edge Bundles* or *Table View*);
- Right-click the studies on *Table View* to display the quality/selection menu;
- Review decisions of studies on “conflict” state;
- Include or exclude studies by setting the inclusion or exclusion criteria used;
- Change the score of the studies by clicking on the appropriate menu item;

If you have any commentary about a study, worth keeping for the next stage, use the “commentary” feature.

Contact

For questions, suggestions or problems in the use of the tool, contact:

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Katia Romero Felizardo	<i>katiarf@icmc.usp.br</i>

Bibliography

[1] Danny Holten, "Hierarchical Edge Bundles: Visualization of Adjacency Relations in Hierarchical Data", IEEE Transactions on Visualization and Computer Graphics (TVCG; Proceedings of Vis/InfoVis 2006), Vol. 12, No. 5, Pages 741 - 748, 2006.